UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/781,975	02/14/2001	Samuel Dacke Harkness IV	146712001300	9533

25227 7590 02/21/2003

MORRISON & FOERSTER LLP
1650 TYSONS BOULEVARD
SUITE 300
MCLEAN, VA 22102

EXAMINER	
UHLIR, NIKOLAS J	

ART UNIT	PAPER NUMBER
1773	7

DATE MAILED: 02/21/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/781,975	Applicant(s) HARKNESS ET AL.	
	Examiner Nikolas J. Uhlir	Art Unit 1773	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 December 2002* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,6-12 and 16-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2 and 6-125* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☒ Interview Summary (PTO-413) Paper No(s). *8* .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

1. This office action is in response to the amendment dated 12/13/02. Applicant's amendment to the instant claims presents a combination that was not earlier presented in the examination of this application. Accordingly, the prior rejection under 35 U.S.C 103a is untenable and is hereby withdrawn. Further, the examiner acknowledges applicants amendment to correct various 112 issues present in the claims. The amendments are sufficient to overcome the 112 rejections. Thus, the prior rejection under 35 U.S.C 112 is withdrawn. A new rejection on the merits follows. As this new rejection is a result of the applicant's amendment, this office action is final.

Claim Rejections - 35 USC § 103

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 1-2, 6, 9, 11-12, and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Song et al. (US6146754) in view of Tanahashi et al. (US6001447).

4. Regarding the limitations of claim 1, wherein the applicant requires a magnetic recording medium comprising a substrate, a seedlayer on the substrate, a Cr containing first underlayer, a HCP underlayer, and a magnetic layer in this order, wherein a portion of the seedlayer is oxidized, the seedlayer comprises a Cr-X material, wherein X is selected from Al, Ca, Ti, V, Mn, Fe, Co, Ni, Zn, or a mixture thereof, and the solid solubility of X is at least 3 atomic % in chromium.

5. To be clear on the record, the examiner interprets the phrase "in this order" to be open language which requires that the position of the layers relative to one another be

the order specified in the claim, but allows for additional layers to be present in the recording medium other then those specified. Further, the examiner interprets "HCP" to mean, "hexagonal close packed," as "HCP" is the industry accepted acronym for this crystal structure. Last, the examiner interprets "solid solubility of said X is at least 3 atomic % in Cr" to mean that at least 3 atomic % of X must be able to be dissolved/incorporated into Cr. More specifically, the examiner does not interpret this phrase to mean that more then 3 atomic % of X must be present. Thus, a CrTi film without a specific compositional ratio still reads on applicants claimed solid solubility ratio, as Ti is listed as a suitable X material having a solid solubility that is >3 atomic % in X.

6. With respect to claim 1, Song et al. (hereafter Song) teaches a magnetic recording medium comprising a substrate, a seedlayer on the substrate, an underlayer on the seedlayer, and a magnetic layer (equivalent to applicants magnetic layer) on the underlayer (figure 5 and column 4, lines 27-33). More specifically, Song teaches that the seedlayer can be formed from Cr or Cr alloys such as CrV or CrTi (column 6, lines 47-50).

7. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize CrTi, or CrV as the material for making the seedlayer of Song, as these materials are taught to be equivalent to the others listed as suitable for the formation of the seedlayer. The applicant is respectfully reminded that substitution of equivalents requires no express motivation as long as the prior art recognizes the equivalency. *In Re Fount* 213 USPQ 532 (CCPA 1982); *In Re Siebentritt*

152 USPQ 618 (CCPA 1967); *Grover Tank & Mfg. Co. Inc V. Linde Air Products Co.* 85 USPQ 328 (USSC 1950).

8. Regarding the limitation in claim 1 as to the solid solubility of X in Cr. The examiner takes the position that the solid solubility of one material in another is a material property. Thus, when a CrTi or CrV layer is utilized as the seedlayer, the examiner takes the position that the limitation in claim 1 requiring X to have a solid solubility of at least 3 at. % in Cr is met, as Ti and V are listed in the instant application as suitable X materials having the required solid solubility.

9. Further, Song teaches that the seedlayer is heated in an atmosphere containing oxygen so as to oxidize the surface of the seedlayer (column 6, lines 33-38). This meets applicant's limitations requiring a portion of the seedlayer to be oxidized. Thus, when oxygen is incorporated into a CrTi or CrV layer, all of the compositional limitations in claim 1 for the CrX material are met.

10. Regarding the limitation in claim 1 requiring a Cr containing first underlayer, Song teaches that the underlayer utilized is manufactured from Cr or a Cr alloy such as CrV, CrTi, and CrTiB, and can be a single layer or multiple layers (column 6, lines 53-60). Thus, this limitation of claim 1 is met.

11. However, Song fails to teach a HCP underlayer deposited between a Cr containing underlayer and a magnetic layer, as required by claim 1.

12. However, with respect to this deficiency, Tanahashi et al. (hereafter Tanahashi) teaches a magnetic recording medium that comprises a substrate, a multilayer underlayer system, and a magnetic layer (column 8, lines 7-24). The multilayer

underlayer system comprises one layer comprising a hexagonal close packed (hcp) material that is formed between the magnetic layer and a first underlayer (column 2, line 64-column 3, line 2). For the purpose of lattice tuning capability with the magnetic layer, the hcp layer should preferably have Co and Cr as its main components (Column 4, lines 16-27). More specifically, the 1st underlayer is present between the substrate and the CoCr layer, and comprises an body centered cubic (bcc) material, including Cr or Cr alloys such as CrTi, CrV, CrMo, and the like (column 4, lines 59-67). The magnetic layer is formed from a Co containing alloy, such as CoCrNI, CoCrTa, and CoCrPt (column 2, lines 54-58). Magnetic recording media having this structure have magnetic layers that exhibit better crystallinity then magnetic recording media that have the magnetic layer formed directly on a Cr or Cr alloy underlayer (column 3, lines 4-13 and column 4, lines 16-25).

13. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a HCP CoCr layer as taught by Tanahashi between the Cr alloy underlayer and the magnetic layer taught by Song.

14. On would have been motivated to make this modification due to the fact that the Song utilizes a Cr alloy underlayer and magnetic layer that is similar or identical to the Cr or Cr alloy underlayer utilized by Tanahashi, and the teaching in Tanahashi that the crystallinity of the magnetic recording layer is improved by utilizing an HCP CoCr layer between the magnetic layer and a bcc Cr or Cr alloy underlayer.

15. Regarding the limitations of claim 2, wherein the applicant requires the lattice tuning capability of X to be at least 2% that of Cr. To be clear on the record, the

examiner interprets this limitation to require that the X material be able to adjust one or more lattice parameters of a Cr crystal by at least 2%, as is commensurate with the description of this property provided in the instant specification (page 8-9, lines 20-1). The examiner takes the position that the lattice tuning capability of a material is a material property. Thus, when CrTi, or CrV is utilized as the seedlayer in Song, the limitations of claim 2 are necessarily met, as Ti and V are listed as X materials possessing the required property in the instant specification.

16. Regarding the limitations of claim 6, wherein the applicant requires that the oxidized portion of the seedlayer contain between 0.0001-20 atomic % oxygen. Song teaches that when the seedlayer is heated in an oxygen containing atmosphere, the seedlayer is oxidized and contains up to 1 atomic % oxygen (column 6, lines 33-40). Thus, as 1 at. % is completely encompassed within the applicants claimed range, the limitations of claim 6 are met.

17. Regarding the limitations of claim 9, wherein the applicant requires the second underlayer to comprise a CoCr containing material to form a first magnetic recording medium that exhibits a stronger CoCr 110 peak by x-ray crystallography than that of a second magnetic recording medium that is similar to the first magnetic recording medium, except that the seedlayer of the second magnetic recording medium contains substantially pure Cr. Regarding claims 9 and 19, wherein the applicant requires that a magnetic recording media comprising a Cr-X underlayer and a CoCr containing underlayer to form a first magnetic medium exhibit a stronger (110) peak by X-ray crystallography than that of a second magnetic recording medium that comprises a Cr

underlayer and a CoCr containing underlayer. The examiner takes the position that the strength of an X-ray crystallography peak is a material property. Thus, as the combination of Song with Tanahashi results in a material having the same structure and is formed from the same materials as disclosed by the applicant in both the specification and the claims, this limitation is met.

18. Regarding claims 11-12, and 19, wherein the applicant requires a generic method for forming a magnetic recording medium that has identical characteristics to the magnetic recording medium required by claims 1-2 and 9. The method limitations present in claims 11-12 and 19 are nominal, requiring only that the recited layers be "deposited." As the combination of Song and Tanahashi as stated above for claims 1-2 and 9 would necessarily require the "deposition" of these layers in the required order, the limitations of these claims are met.

19. With respect to claim 20, wherein the applicant requires a magnetic recording medium comprising a means for low noise recording, a magnetic layer, an underlayer comprising a Cr containing material, and a layer for allowing a BCC-HCP transition to occur between the underlayer and the magnetic layer. To be clear on the record, the examiner interprets the required "means for low noise recording" to require that a Cr-X layer is utilized, wherein X has a solid solubility of at least 3 atomic % in Cr, said X having a heat of oxide formation of >200kcal/mol **or** a lattice tuning capability of at least 2% that of Cr, as is commensurate with the definition provided for this phrase on pages 6-7 of the instant specification. It is the examiners position that the limitations of claim 20 are met as set forth above for claim 1. The combination of Song with Tanahashi

results in recording medium having a substrate, a CrTi or CrV seedlayer, a Cr or Cr alloy 1st underlayer, a CoCr 2nd underlayer on the 1st underlayer, and a magnetic layer on the CoCr layer. As is shown by Tanahashi, the CoCr layer provides the required transition from a bcc to hcp crystal structure. Further, when Ti or V is utilized, the limitation of a "means for low noise recording" is met, as Ti and V are listed in the instant specification as suitable X materials that have a lattice tuning capability of 2% that of Cr and a solid solubility fo at least 3 atomic % in Cr. Thus, the limitations of claim 20 are met by the combination of Song and Tanahashi

20. Claims 7, and 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Song as modified by Tanahashi as applied to claim 1 and 11 above, and further in view of Suzuki et al. (US5143794), as evidenced by Bertero et al. (US6150015).

21. Song as modified by Tanahashi above fails to teach an oxidized seedlayer that contains between 0.01-0.9 atomic % O, as required by claims 7 and 16. Further, the combination of Song and Tanahashi fails to teach that the grain size of the oxidized portion of the seedlayer is 10nm or less, as required by claim 17.

22. However, with respect to these shortcomings, Suzuki et al. (hereafter Suzuki) teaches that adding oxygen to Cr alloy underlayers impacts the grain size of the underlayer (column 12, lines 19-27). Specifically, the magnetic grains are made finer with increasing amounts of oxygen resulting in decreased grain size (column 5 lines 20-25). It is important to note that it is well established in the art of magnetic media that when magnetic layers are deposited over a seedlayer, the grain size of the magnetic layer is controlled by the grain size and spacing of the underlayer, with lower grain size

resulting in reduced noise (as evidenced by Bertero et al., column 14, lines 18-35). Thus, the examiner takes the position that the amount of oxygen added to the Cr alloy underlayer of Song is a results effective variable. It would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust the concentration of oxygen in the seedlayer to achieve a desired grain size in both the seedlayer and the magnetic layer formed above the seedlayer. Further, it would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust the grain size of the seedlayer to a desired value to achieve a desired level of noise in the magnetic recording medium.

23. Claims 8, 10, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Song as modified by Tanahashi as applied to claims 1 and 11 above, and further in view of Ivett et al. (US5298324).

24. Song as modified by Tanahashi does not teach a magnetic recording medium utilizing a Cr-X seedlayer that is Cr-10W, and and a CoCr 2nd underlayer that is Co-37Cr, as required by claim 10. Further, Suzuki et al. as modified by Tanahashi et al. does not teach a Cr-X seedlayer or a method for making a Cr-X layer, wherein the Cr-X seedlayer has a (110) inter-planar spacing that is roughly equivalent to the (0002) inter-planar spacing of a HCP alloy within a CoCr containing underlayer or a magnetic layer deposed on top of the seed layer, as required by claims 8 and 18.

25. With respect to the use of a W containing Cr underlayer. The examiner acknowledges that Song does not teach adding W to the Cr alloy seedlayer. However, it

is noted that Suzuki teaches the equivalence of Cr-W to CrV as materials suitable for use in underlayers of recording media (see column 15, lines 30-37).

26. Therefore it would have been obvious to one of ordinary skill in the art to utilize CrW as taught by Suzuki as the seedlayer in Song, as CrW is taught to be equivalent to CrV as a suitable underlayer material.

27. With respect to the amount of Cr in the CoCr containing underlayer, Tanahashi et al. teaches that for the purpose of lattice matching with the magnetic layer, the CoCr hcp layer should preferably contain between 26-50 atomic % Cr. When the amount of Cr drops below 26%, the hcp is magnetic and affects the magnetic properties of the magnetic layer formed on top of it. Conversely, if the amount of Cr exceeds 50%, the hcp layer cannot exhibit good crystalline structure (Column 4, lines 16-27). Thus, the examiner takes the position that the amount of Cr in the CoCr layer is a results effective variable, and it would have been obvious to one with ordinary skill in the art at the time the invention was made to vary the amount of Cr in the hcp layer to optimize the lattice matching of the CoCr layer with the magnetic layer, while simultaneously avoiding the drawbacks of too little or too much chromium.

28. With respect to the amount of W in the Cr-W seedlayer, Ivett et al. teaches a magnetic recording medium comprising a substrate, an underlayer comprised of Cr-W, and a Co based magnetic layer (column 3, lines 30-35). The Cr-W layer typically comprises 85-99 atomic % C (1-15 atomic % W). The amount of W used is chosen so as to achieve lattice matching between the Cr-W layer and a Co based layer deposited on top of the Cr-W layer (column 4, lines 64-68). As the atomic size of Cr and Co is

roughly the same, the lattice matching is achieved due to the large atomic radius of W as compared to Cr and Co (column 5, lines 55-64). Thus, the examiner takes the position that the amount of tungsten is a results effective variable. The addition of more tungsten will result in greater expansion of the Cr lattice then the addition of less tungsten. Thus, it would have been obvious to one with ordinary skill in the art at the time the invention was made to optimize the amount of tungsten used in the Cr-W underlayer in order match the lattice spacing of the underlayer to a Co based layer deposited on top of the Cr-W layer. Magnetic media that have a Cr-W underlayer that is lattice matched with the Co based alloy layer deposited above the Cr-W layer exhibit no reduction in coercivity as the thickness of the underlayer is increased, thus the thickness of the underlayer need not be tightly controlled as was required by other conventional underlayers (column 6, line 62-column 7, line 9)

29. Therefore it would have been obvious to one with ordinary skill in the art at the time the invention was made to vary the content of W and Cr in the Cr-W and CoCr underlayers taught by Suzuki et al. as modified by Tanahashi et al. to optimize the lattice match between the underlayer/seedlayer and the magnetic layer.

30. One would have been motivated to make these modifications due to the teaching in Tanahashi et al. that the amount of Cr in the CoCr layer impacts the lattice structure of the CoCr layer, and the teachings in Ivett et al. that the amount of W added to a Cr-W underlayer impacts the lattice structure of the Cr-W layer and that magnetic recording media having a Cr-W seedlayer that is lattice matched to a Co based layer deposited on the Cr-W layer exhibit no reduction in coercivity as a function of the seedlayer thickness.

31. Regarding claims 8 and 18, although neither Suzuki, Tanahashi, or Ivette explicitly teach optimizing the (110) spacing of the Cr-X material to the (0002) inter-planar spacing of a HCP alloy within the CoCr underlayer or the magnetic layer, the examiner takes the position that it would have been obvious to one of ordinary skill in the art at the time the invention was made to match **any** lattice spacing of the seedlayer to **any** lattice spacing of either an underlayer or magnetic deposed above the seedlayer. One would have been motivated to due so due to the teaching in Ivette et al. that a magnetic recording media that has a seedlayer that is lattice matched to an underlayer exhibits no reduction in coercivity as a function of the seedlayer thickness.

Response to Arguments

32. Applicant's arguments filed 12/13/02 have been fully considered but they are not persuasive. Although applicants arguments are moot in view of the new grounds of rejection, the examiner feels it would be beneficial to discuss some of the applicants arguments, particularly those related to unexpected results.

33. The applicant has presented the argument that the applicant unexpectedly discovered that the presence of a non-oxidized Cr containing layer between an oxidized Cr alloy seedlayer and an HCP underlayer prevents the diffusion of oxygen from the oxidized seedlayer to the HCP layer, thereby preventing the oxidation of the bcc-hcp interface, while simultaneously increasing the number of nucleation sites on the seedlayer. While the examiner does not refute that the finding that the non oxidized layer prevents oxidation may have been unexpected, it has not yet been established that the prior art structure resulting from the combination of Song with Tanahashi would

not have been obvious to one of ordinary skill in the art, and would not exhibit the applicants argued benefit.

34. It is true that neither Song nor Tanahashi address the issue of bcc-hcp interface oxidation, which is the motivation behind the instant application. However, there is clear motivation in the cited prior art to form a structure that is substantially similar or identical to the instantly claimed invention. Specifically, when CrTi or CrV is utilized as the oxidized seedlayer, a non oxidized Cr or Cr alloy layer is utilized as an underlayer on the seedlayer and a CoCr layer as taught by Tanahashi is utilized between the underlayer and magnetic layer of Song, a structure that is identical to that of the applicants claimed invention is formed.

35. The examiner acknowledges that references may only be combined when there is some teaching or motivation to one of ordinary skill in the art to do so. There is clear motivation to utilize CrTi or CrV as the seedlayer in the combination of Song and Tanahashi as these materials are clearly taught to be equivalent to the other materials cited as suitable. Further, there is clear motivation to provide a CoCr layer between the underlayers and the magnetic layer, as Tanahashi clearly teaches that doing so improves the lattice match between a magnetic layer and a Cr or Cr alloy underlayers that are similar or identical to those disclosed in Song. Thus, while the prior art does not address the oxidation problem that is asserted by the applicant, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form a magnetic media having the applicants claimed structure, with an expectation of success.

36. Applicants are reminded that it has been held that the fact that an applicant has recognized another advantage that would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985). The examiner maintains that in light of the teachings of Song and Tanahashi, the formation of a magnetic media having the structure required by the applicant in the instant claims would have been obvious to one of ordinary skill in the art, albeit for different reasons then those addressed by the applicant. Accordingly, this argument is not persuasive.

Conclusion

37. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nikolas J. Uhlir whose telephone number is 703-305-0179. The examiner can normally be reached on Mon-Fri 7:30 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Thibodeau can be reached on 703-308-2367. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-0389.

nju
February 12, 2003

STEVAN A. RESAN
PRIMARY EXAMINER